Two-sided peri-urbanity: Cairo's desert sprawl against fertile encroachment

Peri-urbanidad a dos caras en El Cairo: "sprawl" desértico, informal agrícola

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Abstract

Set amidst the desert and the valley of the Nile, the peri-urban area of Cairo megalopolis is a unique case of urbanization, made complex by the blend of planned and informal: moving away from the centre, formal districts blend with irregular additions, eventually giving way to compact informal neighbourhoods fluidly extending from the very same network of canals and fields that had previously sustained a now receding rurality: canals transform into streets, fields into multiform volumes. Throughout, expressways cross this lush landscape, contrasting it with a more global type of urbanisation, with disjointed, segregated compounds, which expand over the desert: a mix of low-density, leisure spaces and facilities of all kinds. two contrasting landscapes in peri-urban Cairo, akin to the two sides of a cassette tape. The "A-side" represents the organic growth of compact, community-driven informal settlements encroaching upon former rural areas. In contrast, the "B-side" depicts multiform urban compounds, purportedly planned desert cities, yet behaving as exclusive monofunctional sectors reliant on vast car infrastructures. This extreme duality, between Nile and Sahara, forges a unique peri-urban dichotomy, which emerges as an unlimited megalopolis.

Keywords

Peri-urban Cairo; Informal housing; New desert cities; Urban morphology; Rural space

Resumen

Situada entre el desierto y el valle del Nilo, la zona periurbana de la megalópolis de El Cairo es un caso único de urbanización compleja por la mezcla entre lo planificado y lo informal. A medida que nos alejamos del centro, la ciudad formal se diluye, dando paso a barrios informales compactos que se extienden sobre la misma red de canales y campos que antes había sostenido una ruralidad ahora en retroceso: los canales se transforman en calles, los campos en volúmenes multiformes. Por todas partes, las autopistas atraviesan este exuberante paisaje, y lo contraponen a un tipo de urbanización más global, con complejos urbanos desarticulados y segregados que se expanden sobre el desierto: una mezcla de urbanizaciones de baja densidad, espacios de ocio y equipamientos de todo tipo. El artículo ahonda en el contraste ecosocial y urbano entre estos dos paisajes tan opuestos, como si fueren las dos caras de una misma cinta de casete. La "cara A" representa el crecimiento orgánico de asentamientos informales compactos y comunitarios que invaden los suelos fértiles agrícolas. En cambio, la "cara B" muestra conjuntos urbanos multiformales planificados como pretendidas ciudades en el desierto, actualmente exclusivos sectores monofuncionales servidos por las grandes infraestructuras rodadas. Esta dualidad extrema, entre Nilo y Sáhara, fragua una dicotomía peri-urbana única, que emerge como una megalópolis sin límites.

Palabras clave

Cairo periurbano; Asentamientos informales; Nuevas ciudades desérticas; Espacio rural; Morfología urbana

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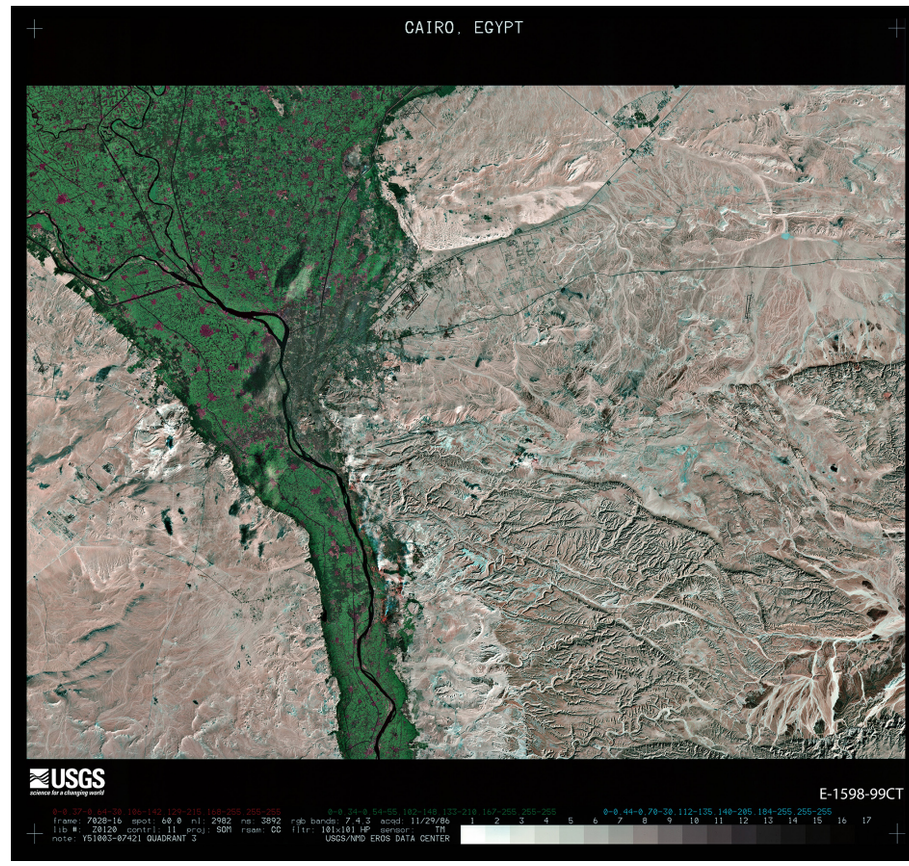

Figure 1. The fertile Nile as it flows through the Sahara Desert, with the city of Cairo at the vertex of the river's delta. USGS, Cairo, Egypt, Landsat 5 Thematic Mapper satellite image, PA-E-1598-99CT, November 1986.

A dual peri-urban landscape in Greater Cairo

The city of Cairo is set within a unique position between the Sahara Desert and the wetlands of the Nile River, growing before its vast delta fans towards the sea (figure 1). Nestled in the strip of green that houses 95% of Egypt's population in only 5% of the country's surface, thanks to the extremely fertile Nile ecosystem, the city has grown to be recognised as a megacity, as it has multiplied by 10 its 1947 population: Cairo now houses 22.64 million people[1]. In this expansive territory, the condition of the peri-urban constantly changes, as the extreme dynamics of urban growth shift the boundaries of the built city following a dual phenomenon. On the one hand, the hyper-dense "informal" settlements swallow dozens of hectares of valuable arable land both to its north and south[2]. On the other hand, the Desert New Towns to the east and west, established by the government as an attempted counterbalance, have now become disjointed compounds, preyed upon by speculators. Within the Nile valley, the encroaching on fertile land limits the city's eco-system services on a territorial scale: urban development has divided the Nile's canyon and delta ecosystems. Consolidated since the 1980's when Cairo land grew enough to cut across the entire fertile strip of the Nile (figure 1), the impermeabilization of soil on a large scale separates the Nile's ecosystems in surface and section, sealing groundwater from above-ground, increasing the urban heat island effect. The relationship between the soil and the urban environment is key[3] and, among ecosystem services the issue of provisioning has taken considerable interest: the loss of highly limited arable soil due to urbanisation led to it becoming the driving force of most of the city's planning attempts, of special note in Cairo due to its exceptional territory[4].

In the second half of the 20th Century, the urban growth of Greater Cairo has followed two main logics: 1) that of the so-called "informal" which has devoured thousands of square kilometers of fertile agricultural land via incremental housing schemes that replace canals and fields, subverting the internal logic of the Egyptian countryside in specific patterns of informal growth linked to local con-

1 CAPMAS, "CAPMAS Central Data Catalog," 2023.

2 It is estimated that over 1.200 ha were lost per year between 2011 and 2018 according to Muhammad Salem, Naoki Tsurusaki, and Prasanna Divigalpitiya, "Land Use/Land Cover Change Detection and Urban Sprawl in the Peri-Urban Area of Greater Cairo since the Egyptian Revolution of 2011," *Journal of Land Use Science* 15, no. 5 (2020): 7.

3 Paola Viganò, Martina Barcelloni Corte, and Antoine Vialle, "Le Sol de La Ville-Territoire," *Revue d'anthropologie Des Connaissances* 14, no. 4 (2020).

4 Keith Sutton and Wael Fahmi, "Cairo's Urban Growth and Strategic Master Plans in the Light of Egypt's 1996 Population Census Results," *Cities* 18, no. 3 (2001): 137.

Figure 2. Authors, Satellite Cities in the desert and Informal Settlements on the delta, Maxar Imagery 2023.

ditions; And 2) that of the desert satellite cities, planned attempts at redirecting growth east and west toward the desert, following global patterns, built in the carte blanche that the desert promises: new settlements of all kinds composed of disjointed, autonomous pieces without any relation to their surroundings except their connection with the titanic highway networks that savagely crisscross the Nile's plain to connect both sides of the desert and the ultra-urban Central Cairo, itself an inner core torn apart by these two forms of growth, which now define the peri-urban landscape of the city (figure 2).

The stark duality of these two self-contained and opposing forms of growth is observed through three main parameters that make exceptional the intersection between informal and formal, and limit the growth of these two forms to specific environments. These parameters are 1) **Geography**, either fertile or desertic, linked to either agricultural structures such as canals and fields through which "informal" urban development grows, or the enormous void of the desert, the promise of the tabula rasa that allows the "formal" compounds to flourish 2) **Urban Form**, as the specific, procedural, dense and compact informal housing tenements are a result of the sub-division of farm plots and the urbanization of canals, whereas the form of the isolated compounds in the desert is self-referential and only linked to highway 3) **Land Governance**, specifically, land ownership and planning (or lack of thereof): if the fertile patchwork is owned by many private landowners as a result of land redistribution policies, the desert is entirely controlled by the Public Authority, and is sold in large unitary chunks following planned projects. In the fertile region, the scarcity of public land results in a shortage of public services. This, combined with a tenuous land tenure system[5], leaves communities sidelined and dependant on self-organised social fabrics, as the government instead invests on large-scale car infrastructures that cross the delta, bypassing these areas, connecting the inner core with the State-sponsored cities in the desert.

5 David Sims, "Securing Land Tenure in Egypt: Who Needs Registered Titles?," *Metropolitics* 14 (2016): 1–6.

Figure 3. N.A., Ploughing near the Pyramids of Gizeh, N.D., Lantern Slide 3.25x4in, 3.25 x 4 in., Lantern Slide Collection, Brooklyn Museum.

The analysis of these two opposing landscapes, set against each other like the two sides of a cassette tape, is the subject of this paper. Under the optics of geography, form and governance, if the A-side is the procedural, increasingly compact, yet community-driven informal, growing over the formerly rural fertile land; the B-side are the planned, low-density, and segregated desert cities, entirely dependent on car infrastructure.

The agricultural landscape at the root of the periphery

"The sole wealth of Egypt is derived from its agriculture, and to the fellahin alone is committed the important task of tilling the soil": as stated by a 19th century travel account[6], agriculture is the backbone of the Egyptian economy, and the fellaheen (labourers) are the ones who support it.

Within the confines of the fertile floodplains of the Nile, flanked by the Sahara on both sides, the Cairene countryside is composed throughout by the feddan, "yoke", a local unit of measuring area originally referring to a surface tillable by a group of oxen (figure 3), equivalent to 4,200 square meters, further sub-divided into 24 qirats of 175 square meters, made of 24 sahim, 7.29 square meters each, used as a base unit. Farms in peri-urban Cairo consist of elongated fields, feddaren, up to 30 meters wide and 200 meters long, almost 2 feddan in surface, stretching up to the private merwa ditches, and the bigger mesqas, connecting with the public canals that irrigate and drain water from and towards the Nile[7]. The residences of the fellaheen follow the logic of the canal, the ditch, and the feddaren. In a pattern which is repeated all along the Nile, villages are made of concrete frames filled with brickwork sourced from the field's mud, lacking many windows and plaster due to climatic and cultural reasons, the result is a brown mass nestled between vibrant green fields: its size expands vertically to preserve the valuable arable land, reaching five to six storeys.

As usual in irrigated agricultural landscapes, water control and fertility dictate the geometry and measures of the artificialized landscape, with settlements relegated to less useful land such as margins and hills. The construction of hydraulic infrastructure has made the Nile predictable, as the culture-defining summer floods of the river have been tamed, allowing for further artificialisation of the river valley. In the proximity of Cairo, urban development has taken precedence over agriculture. Agricultural production, either by owners-farmers or by renters, stops. In the first case, farming practices are discontinued as inheritors either sell or develop their plots, and in the second, renters in the last three decades have seen generational contracts replaced by yearly agreements, as owners are likely to take up increasingly common lucrative offers to urbanize their land (despite the risk of illegal conversions from agricultural to urban)[8].

6 Baedeker, Egypt : *Handbook for Travellers: Part First, Lower Egypt,* ed. Karl Baedeker (Leipgzig: Karl Baedeker, 1885), 41.

7 Mohamed Abdel Meguid, "Key Features of the Egypt's Water and Agricultural Resources," *Handbook of Environmental Chemistry* 74 (2019): 54.

8 Annabelle Daburon et al., "Urban and Peri-Urban Agriculture, the Dairy Farms of Cairo, Egypt," *Diversity of Family Farming Around the World: Existence, Transformations and Possible Futures of Family Farms,* 2019, 33–34.

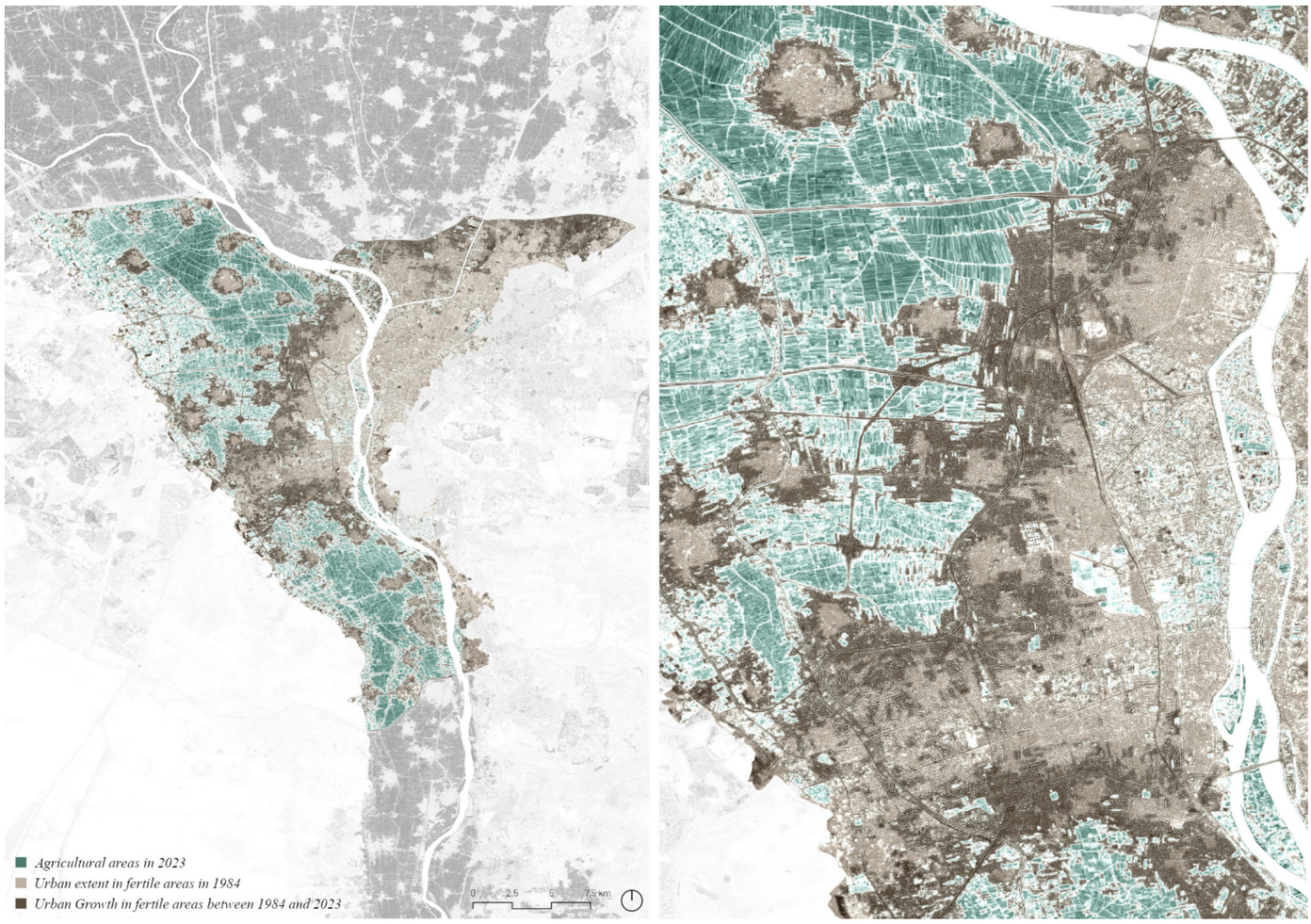

Figure 4. Authors, Urban expansion on fertile land around Cairo, 1984-2023 (dark brown), NDBI Satellite Imagery Analysis, Data from USGS Landsat 5 SR, Copernicus Sentinel-2 MSI.

Unbound by agrarian logics that limit land consumption, the old villages have become embryos around which unbridled construction preys upon the framework of the canal and the field, a procedural process which firstly sees new buildings disturb the continuity of canals, sub-dividing farms, polluting the water supply and impeding drainage, leading to land salination as accumulated water evaporates. In turn, this facilitates the appearance of more buildings, spurring harrowing tales of evictions, harassment and abandonment as farmers are only able to operate using wells as canals are cut-off[9].

This process takes place in the "Peri-Urban Frontier" of Cairo, as urban researcher David Sims elucidates[10]: it is formed by the built-up perimeter of Central Cairo, creeping towards the fertile plains, where rural settlements, distributed in a polycentric pattern, also expand following the traces of the main canals and roads. These two informal expansion vectors, from Central Cairo and from the villages, have joined, as the towns have reached the city of Cairo itself in the latest years, thus encircling pockets of green between the towns and the metropolis (figure 4)[11].

A-side: the informal massive settlements, or the subversion of the fertile

The procedural transformation of Cairo's fertile periphery can be best described as the sub-division and illegal multi-step development of privately owned agricultural land, resulting in what is known as "informal housing"[12]. Informal housing generally did not develop in the desert, entirely managed by the state, and the few informal housing cases that developed in desert land (such as Manshiet Nasser near the Citadel) found a much less straightforward logic of growth, without pre-established structures (both legal and agricultural) to subvert. Ongoing since the late 1950's, as 1956 legislation shielded pioneering sub-division efforts, informal housing construc-

9 Charlotte Malterre-Barthes and Lorenz Bürgi, "Receding Rurality: Cairo's Informal Urbanization versus Local Food Production", *urbanNext,* 2016.

10 David Sims, *Understanding Cairo, The Logic of a City without Control* (Cairo-New York: The American University in Cairo Press, 2012), 92.

11 Sims, 94–95.

12 The term "informal housing" (also known as "'ashwa'iyyat" in Arabic, meaning "disordered" or "haphazard", despite its well-ordered urban structure) has been used to refer to the specific phenomenon of the massive unplanned settlements (an alternative nomenclature preferred by the government) built over former agrarian land in Egypt since landmark studies such as USAID, "Informal Housing in Egypt," 1982; and has seen continued use in more recent contributions such as Marc Angélil and Charlotte Malterre-Barthes, *Housing Cairo* (Berlin: Ruby Press, 2016); and Sims, *Understanding Cairo, The Logic of a City without Control.*

tion began in earnest in the 1960's[13]. This amnesty is explained by the overcrowding that overwhelmed the central districts, which densified and decayed due to rent-control legislation that limited maintenance on residential stock: the response of owners toward rent policy was varied, as additions to homes and the build-up of former gardens in Garden City and Zamalek contrasted with the deliberate decay or residential-to-commercial conversion of tenements in Downtown, a trend still ongoing.

In our present time, 2016 estimates state informal settlements house forty percent of the Greater Cairo metropolitan area's inhabitants, totalling roughly 8.5 million people[14]: imprecise as these figures may be, informal housing represents by far the biggest producer of housing units in Cairo[15] (figure 5). Their astonishing morphology arises from the pre-existing agricultural traces in lieu of planning, as blocks are completely built-up except for a few light and air shafts and an ad-hoc setback on the front, a meter or two from the perimeter, creating "alleys", divided between narrow 2-to-4 meters wide corridors and 8-meter-wide streets made of infilled former canals.

The change from agricultural to urban is initiated when small farmers sell their parcels through a gamaya (an informal savings-and-credit agreement between a few dozen individuals that collects payments for large investments) to entrepreneur land developers via quasi-legal two-party 'urfi "customary" agreements that sidestep the need to register property changes to any cadastre[16], as the purchased fields are then divided, often using the pre-existing agrarian qirats and sahim, as contractors erect each building as money allows lot by lot[17].

Urbanisation is explained through a three-step process, where buildings 1) first scatter among the fields, as lots are sub-divided and developed haphazardly, with early, low-rise buildings often extending away from rural villages or the perimeter of Cairo (figure 5), 2) a second phase follows where urban development begins to align to newly developed traces within a certain area, such as a sewage main or a canal-turned-road, as the "domino-style" buildings extend in surface and height due to new arrivals or demographic growth of the first inhabitants. At this stage, interference with the network of canals impedes agrarian activity, further incentivising urban development 3) a third, final phase where the saturation and maturation of the neighbourhood removes remaining fields: the agrarian framework persists only through its complete conversion into an ad-hoc urban layout in which buildings reach world record high densities through several extensions in height (figure 6)[18]. These concrete-and-brick structures saturate the former farmland, with blocks between 6 and 8 floors on average and 2 to 3 apartments per floor, some larger typologies rise to 14 floors, allowing up to 10,000 residents to live in a former small-scale 4 ha farm when fully developed: densities in mature districts such as Imbaba reach the world's highest[19].

At the final stages of this maturation, from agrarian to urban, the provision of basic resources such as water, electricity, and sewage, is gradually extended. In the early 1990's, the state manufactured ingenious ways to both provide informal neighbourhoods with water and electricity and "regularise" their citizens: a formal electricity connection was considered a valid prerequisite for the issuance of IDs (instead of a registered housing contract), allowing access to healthcare, education, and other services[20]. However, although by 2017 water and electricity had almost complete coverage, sewage only services half of the households[21] as septic tanks and later wastewater lines are often installed through gutud zatiya "self-help" initiatives.

The incremental urbanisation of the rural is vividly documented in novels such as East of the Ring Road[22], which narrates the transition of a rural village near Cairo into a crammed peri-urban town following the construction of the Ring Road. The loss of agricultural livelihood is depicted through a changing landscape with heaps

13 Yahia Shawkat, "Egypt's Housing Crisis The Shaping of Urban Space" (Cairo-New York: The American University in Cairo Press, 2020), 68.

14 Ahmed M. Soliman, "Informal Cairo: The Making of an Urban Fabric," in *Routledge Handbook on Cairo: Histories, Representations and Discourses,* ed. Nezar Al-Sayyad (Abingdon, Oxon: Routledge, 2023), 308; CAPMAS, "Upgrading and Development of Informal Housing in Egypt (in Arabic)" (Cairo, 2016).

15 Galila El Kadi, "Egypt's Housing Crisis. The Shaping of Urban Space [The Housing Crisis in Egypt. The Shaping of Urban Space] by Yehia Shawkat," *NAQD, Politiques de l'habitat Au Maghreb/Machrek et Dans Le Sud Global* 38–39 (2020): 6.

16 Sims, "Securing Land Tenure in Egypt: Who Needs Registered Titles?," 4.

17 Charlotte Malterre-Barthes, "Housing Cairo Self-Initiated Urbanism Architectural Review," *The Architectural Review,* January 2021.

18 Ahmed M. Soliman, "Housing Consolidation and the Urban Poor: The Case of Hagar El Nawateyah, Alexandria," *Environment and Urbanization* 4, no. 2 (1992): 193.

19 Daburon et al., "Urban and Peri-Urban Agriculture, the Dairy Farms of Cairo, Egypt," 34.

20 Shawkat, "Egypt's Housing Crisis The Shaping of Urban Space," 75–76.

21 CAPMAS, "General Census for Population, Housing and Establishments" (Cairo, 2017).

22 Khaled Ahmed, *Sark Al-Da'in [East of the Ring Road]* (Cairo: Al-Misrî li al-nashr wa al-tawzı', 2014).

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Figure 5. Nardine Khaled & Authors, Early-stage Informal settlements south of Cairo, Photograph, March 2024.

Figure 6 (bottom). Authors, Three stages of an informal settlement north-west of Cairo, Photographs, Cross-Sections and Satellite Imagery, Satellite data from Maxar Imagery, 2003, 2011 and 2021.

of construction waste and garbage replacing flowing canals, exploring the anxieties of villagers in the face of the collateral damages of unchecked urbanisation. In their final stages (figure 7), these districts are far removed from the agrarian logics still found further into the periphery, featuring thousands of inhabitants per hectare, with no public spaces or services. Tight-knit communities organize services within walking distance, to the point of pedestrian congestion, such as at intersections where markets thrive. Thanks to collective efforts, these areas boast diverse mixed-use facilities, enjoying a certain independence from central Cairo, despite daily commutes for work, healthcare, and education[23]. Mature informal districts house a diverse population, as they are "demand-driven, incremental in growth, yield a built form that is compact, low-energy consuming, 'walkable,' with an efficient mixture of uses allowing work-home proximity and district self-sufficiency in terms of daily and seasonal needs", despite their marginalization and exposure to illegal activity derived from a lack of effective housing and urban policy, as stated by architect and urban researcher Dr. Dina Shehayeb[24].

Regarding the tenement itself, its construction is often executed without plans, relying on the experience of hired engineers to assess the structural integrity of the concrete structure that has floors added as time goes on (following owner's needs

23 Sahar Attia and Heba Allah Essam E. Khalil, "Urban Metabolism and Quality of Life in Informal Areas," in *Real CORP 2015,* vol. 2 (Ghent: CORP, 2015), 667.

24 Dina K. Shehayeb, "Advantages of Living in Informal Areas," in *Cairo's Informal Areas Between Urban Challenges and Hidden Potentials,* ed. Regina Kipper and Marion Fischer (Cairo: GTZ Egypt, 2009), 36.

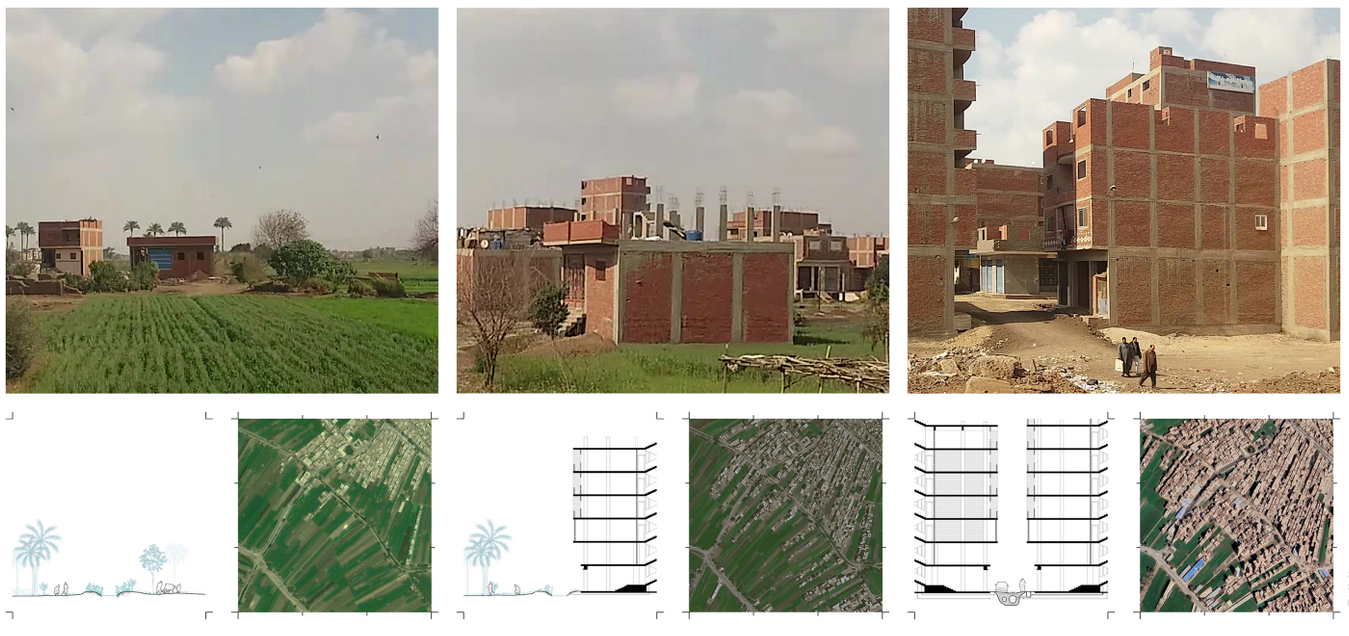

Figure 7. Authors, A mature informal district as seen from the Ring Road, Photograph, March 2019.

or speculative interests), then infilled with brick, with small footprints (between 75 to 125m^2) with few apartments per floor, rising up to seven floors as lifts are only found in newer, taller typologies that reach fifteen floors: these have balconies and brightly coloured plastered facades, and are built as a result of a maturing real estate market, as the formerly small-scale informal enterprises switch to a semi-formal, speculative model, confirmed by the absence of inhabitants in many of the new units, which are left vacant lest their value deprecate[25].

This evolution points towards an increase in complexity within the realm of the informal. Changing market trends have reached the fertile floodplain, increasing the diversity of typologies available, and widening the target demographics of the informal housing sector. In this context, actors of different socioeconomic backgrounds are called: from households unable to purchase dwellings in the central city, instead able to develop an agrarian plot, initiating its urbanisation; small land developers who satisfy housing needs for low and middle-classes in illegally sub-divided farmland; desert settlements developed by public entities initially geared towards lower-income groups yet accessible only to public employees; up to private real estate enterprises who develop arid land serviced by the state which offer high-end housing[26].

B-side: disjoined urban compounds in the desert, or the subversion of urban planning

Insofar as informal settlements can trace their origins to the growth experienced by Egypt following its independence from colonial rule, so it is true of Egyptian city planning. Both logics developed in parallel, yet separate, as newly arrived waves of migration from rural Egypt signalled the country's transition from an agrarian model to an industrial model, making it necessary to come to terms with the incessant growth experienced in the capital. The answer given by socialist planners was that of autonomous industrial centres in the desert, far removed from the delta, to alleviate the dominant position taken by Cairo within the country's demographics and accelerate industrialisation with new productive centres. However, their implementation did not follow through, as only a few of desert clusters developed, all dependant on Cairo, such as Nasr City and Helwan. These were linked to administrative and industrial activity and featured social housing (often offered to political cadres), but they couldn't agglomerate the productive activity as expected, as many workshops dispersed in the vicinity of the capital, in the agrarian periphery where many

25 Sims, *Understanding Cairo, The Logic of a City without Control,* 26, 127.

26 Ameya Joshi and Francesco Tonarelli, "Sub-Dividing Egypt. Process of Land Management and Development," in *Housing Cairo,* ed. Marc Angélil and Charlotte Malterre-Barthes (Berlin: Ruby Press, 2016), 67.

people preferred to live the due to better connections and affordable conditions. The Intifah "open door" policy, introduced by post-socialist President Anwar Sadat in the 1970's, reduced investment in desert public housing while boosting foreign investment and remittances that benefited from the oil boom in the Middle East, leading to further urban development in the agrarian hinterlands[27]. To counter this, Master Plans by the newly created GOPP (General Organization for Physical Planning, Egypt) aided by IAURIF (Institut d'Aménagement et d'Urbanisme de la Région d'Île-de-France) aimed to control informal encroachment on limited arable lands, with a decisive implementation of western "New Town" ideas in the *tabula rasa* of the publicly owned desert[28], and featured all of its rules: land use segregation, low densities, wide, hierarchical streets, "green" belts, spines with commercial and public services, parks, and industrial areas at the outskirts, with a wide buffer around the whole city to avoid encroachment, with over 60% of their surface dedicated to open spaces and public services[29]. Connected to the central core with a vast road system that opened the desert to real estate development, the aim of these cities was to absorb as much population as possible, away from the Nile, and to rejuvenate the country's housing stock. However, satellite cities did not reach their ambitious population targets, housing a meagre 1.1% of the total Greater Cairo population 10 years after their foundation in the 1980's[30]: they were huge, empty construction sites in the middle of the desert. Plots were purchased, yet they saw no construction, as investors awaited better times: the Egyptian economy tumbled, as a decrease in oil prices and the prevalent instability in the Middle East led to a significant reduction in remittances from emigrants.

Since the 1990's, a shift from public to private desert initiatives has emerged, and with it, a systemic change in the logic of the desert settlement: gone the idea of providing mass housing to the population, huge tracts of land were sold for very low prices, and remnants of failed desert initiatives were joined to form new generation desert cities such as New Cairo, which instead targeted middle and elite-classes. Preying upon earlier planning attempts, plots purchased in earlier periods are now seen as a profitable real estate investment, as hundreds of thousands of units have been built, but despite their allure, a significant majority[31] of housing built in the desert remains vacant, as real estate is often seen as a tangible and safe asset due to the fragility of Egypt's economy, instead of a place in which to live in (figure 8).

The image of these new elite districts follows the global logic of segregated closed compounds, as layouts are self-enclosed around looping primary streets that only

Figure 8. Authors, Vacant peri-urban buildings east of Cairo, Photograph, March 2023.

27 Aga Khan, "Cairo, 1800 2000: Planning for the Capital City in the Context of Egypt's History and Development," in *Expanding Metropolis: Coping with the Urban Growth of Cairo* (Cairo: Aga Khan Award for Architecture, 1985), 99.

28 IAURIF, "Region Du Grand Caire," *Cahiers de l'IAURIF,* no. 74 (December 1984): 12.

29 David Sims and Timothy Mitchell, *Egypt's Desert Dreams: Development or Disaster* (Cairo: American University in Cairo Press, 2015), 150.

30 Sims, *Understanding Cairo, The Logic of a City without Control,* 101.

31 Sims and Mitchell, *Egypt's Desert Dreams: Development or Disaster,* 166.

Figure 9. Authors, Compounds near "Dreamland" Golf Course in 6th of October, based on Satellite Imagery by Airbus, August 2022.

connect to the highway, whilst interior secondary roads twist around to reach each of the homes. Adjoining compounds do not connect to each-other, and public spaces as such do not exist. Public services, amenities and shops are in winding strips along or within expressways, with a diverse array of offers such as universities, hotels, hospitals, malls, government offices, eateries and even golf clubs, whereas productive spaces such as industry and warehouses can only be found on the outskirts of the first –and second– generation New Town schemes which ambitioned to become independent cities. Housing ranges from social housing districts built by the government, with apartments between 42 and 72 m^2 evenly spaced with no ground floor retail uses; to large, American-style suburbs with detached homes with gardens and pools, their plots ranging from 500 to 1200 m^2, with some variations such as those found in tower units embedded within parks[32]. These latter developments can be exploited piecemeal or grouped as a "superblock" and sold as part of a "gated community", exacerbating the most noticeable issue of the desert morphology: its disassociation with its surroundings, connected only though an access gate, linked with the highway network, contrasting with a local urban culture focused on compact spaces and community association. These cities generate incongruous landscapes where luxurious green spaces flourish in an otherwise barren desert thanks to complex irrigation techniques, which lose the water employed through evaporation, as the arid plateaus on both sides of the Nile valley do not recharge the river's aquifer. Green has become a status symbol rather than a provider of much needed shade, as lawns and decorative plants abound around compounds far too disjointed to become truly "urban".

Figure 9 showcases how these different forms are inconsistently placed beside the highway, which acts as the only support structure. The services and uses depicted lack coherence, failing to address each-other: By the side of the road, past shops and public services (1), we find a residential complex with a Golf course (2) ("Dreamland", with a Hilton hotel embedded within (3)), wholesale markets (4), a major mall (5), universities (6), different kinds of residences (from social housing (7),

32 Sims and Mitchell, 151.

middle-class military accommodations (8) to luxurious gated communities (9)), film and tv sets (10), and even two water parks complete with roller coasters (11, 12): the tabula rasa of the desert admits all so long as it is car-dependant. This same pattern of public-private real estate development in the desert is ongoing, through the construction of the newest desert initiative of them all, the unnamed New Administrative Capital, which, with its colossal target population of 7 million people and expected size of 700 square kilometres, has seen a relocation of command centres from Cairo itself, dismembering the Central City's fabric in favour of a disembodied set of "functional clusters" only linked by an ever-growing car infrastructure network.

Peri-urban transitions

In the dual and multidirectional urban growth of Greater Cairo, few areas show the transition between the logics of the desert-bound formal and the informal. This can be seen on select spaces at the fringe between the western bank of the Nile and the desert (parcelled in order to establish farms and expand arable land into the desert[33]), where exclusive villa compounds have emerged. These areas exemplify the evolution of formal developments, which were initially designed as alternatives to housing encroaching on the delta. However, they have often become elite suburbs, even expanding into fertile areas, thereby contradicting their original purpose. In doing so, they have made contact with informal areas also settled at the edge of the delta, creating spaces of transition between one model and another.

A notable example (see figure 10) is a resort built in the early 90s north of the Pyramids, at the edge of the Nile delta. This development, entirely reliant on a road straddling the fertile land and desert, has spurred the growth of several residential sectors. These sectors are gravitating towards the desert, with real estate projects extending from 6th of October and El Sheikh Zayed City into this area, ignoring the previously maintained buffer between desert and fertile land. Conversely, around the town of Kirdāsah, to the immediate east of the resort, known for its textile industry, informal encroachment continues to consume fields and canals which serve as guidelines for the urbanisation of the palm groves which once separated the suburb and town. There is an interesting tension in the contact between formal and informal as some tenement units have extended across a major canal towards the resort, nevertheless divided by recent car infrastructure development alongside the canal, which has reinforced the divide. In this way, while formal and informal developments occasionally intersect, they do so only tangentially, at the edge between desert and fertile.

Conclusion

In general terms, the idea of a peri-urban landscape revolves around the notion of an "edge condition" (either sharp or as a gradient) between a certain structured urban centre and a "frayed" periphery sublimating toward the rural territory. Most peri-urban areas feature a low-densities, combining built-up and open spaces in which many kinds of activities overlap, though in contrast to the centre, eco-systemic values tend to be more prevalent.

In Cairo, however, the conceptualization of peri-urban is much more complex due to, on the one hand, the exceptional dynamics of urban growth and the continuous expansion of the megalopolis; and on the other, for the unique phenomenon of the informal city, which has become a genuine "alter-ego" of the traditional formal city. In the transition towards the periphery, many kinds of urban logics are concatenated, but the "two-sided" characteristic landscape stands out: the car-based sprawl compounds isolated in the desert contrasting with the exceptional morphology of the informal settlements in the Nile Valley. Whereas the first follow global patterns

33 Sims, *Understanding Cairo, The Logic of a City without Control,* 230.

Figure 10. Authors, Formal (blue) and Informal (red) growth at the fringe of the desert near Kirdāsah in the Greater Cairo region, based on Satellite Imagery by Airbus, July 2004, May 2024.

of segregation, the second are community-driven incremental housing schemes that range from the ultra-compact mature neighbourhoods which have encroached and removed the fields upon which they are built, to those which can form landscapes that blend concrete-and-brick structures with verdant greenery and palm trees.

The random combination of the multiple pieces of this mosaic shapes the essence of the Greater Cairo, made up of both large global urban products and, at the same time, small local fragments, built piece by piece to host the thousands of newcomers drawn by the dream of urban progress. From an overall perspective, this progress will only be possible upgrading both the city's internal weaknesses and improving the lack of interaction among isolated pieces, in the search of a more balanced patchwork within the different areas of the endless megalopolis.

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Autorship

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Figure sources

Figure 1. USGS, Cairo, Egypt, Landsat 5 Thematic Mapper satellite image, PA-E-1598-99CT, November 1986.

Figure 2. Authors, Satellite Cities in the desert and Informal Settlements on the delta, Maxar Imagery 2023.

Figure 3. N.A., Ploughing near the Pyramids of Gizeh, N.D., Lantern Slide 3.25x4in, 3.25 x 4 in., Lantern Slide Collection, Brooklyn Museum.

Figure 4. Authors, Urban expansion on fertile land around Cairo, 1984-2023, NDBI Satellite Imagery Analysis, Data from USGS Landsat 5 SR, Copernicus Sentinel-2 MSI.

Figure 5. Nardine Khaled & Authors, Informal settlements south of Cairo in their early stage, Photograph, March 2024.

Figure 6. Authors, Three stages of an informal settlement north-west of Cairo, Photograph, Cross-Sections and Satellite Imagery, Satellite data from Maxar Imagery, 2003, 2011 and 2021.

Figure 7. Authors, A mature informal district as seen from the Ring Road, Photograph, March 2019.

Figure 8. Authors, Vacant peri-urban buildings east of Cairo, Photograph, March 2023.

Figure 9. Authors, Compounds near "Dreamland" Golf Course in 6th of October, based on Satellite Imagery by Airbus, August 2022.

Figure 10. Authors, Formal and informal growth at the edge of the desert near Kirdāsah in the Greater Cairo region, based on Satellite Imagery by Airbus, July 2004, May 2024.

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